

change 7 having an output shaft 8 communicating via a transmission (not shown) with the vehicle wheels (not shown).

[0018] The clutch 5 is coupled to a first actuator unit 10 (of known type), in particular an actuator unit actuated hydraulically by means of pressurised oil, in order to open and close the clutch 5. The first actuator unit 10 comprises a power unit 10a which receives drive signals OPEN/CLOSE for the opening or closure of the clutch.

[0019] The gear change 7 is coupled to a second actuator unit 12 (of known type), in particular an actuator unit actuated hydraulically by means of pressurised oil, in order to carry out the operations to select the gears and to engage/disengage the gears selected.

[0020] The second actuator unit 12 comprises a power unit 12a which receives drive signals SEL for the selection of the rank of gears and command signals ENG/DIS for the engagement/disengagement of the gear selected.

[0021] The automatic transmission 1 comprises an electronic control unit 15 which receives a plurality of data and control signals as input and generates as output the above-mentioned drive signals OPEN/CLOSE for the opening or closure of the clutch 5 and SEL, ENG/DIS for the selection and engagement/disengagement of the gears of the gear change 7.

[0022] The electronic control unit in particular receives as input a plurality of data signals measured by sensors 16 and connected with the operation of the engine 2 (engine rotation speed, quantity of fuel injected into the engine, torque supplied, etc.) and with the operation of the gear change 7 and the course of the vehicle (vehicle speed, accelerator position, etc.).

[0023] The electronic unit 15 further receives control signals generated by a selector device 17 which can be manually operated by an operator (not shown).

[0024] In the non-limiting embodiment shown, the selector device 17 comprises a lever member 20 which can be disposed in a stable position in order to actuate a manual operating method of the transmission 1. The lever member 20 may further be manually displaced from the stable position to two opposite unstable positions

(shown by UP and DOWN in Fig. 1) in order to command a unit increment (UP-SHIFT) of the gear engaged and a unit decrement (DOWN-SHIFT) of the gear engaged.

- [0025] A push-button P is also provided and can be actuated to select the automatic operating method.
- [0026] It will be appreciated that the selector device 17 may have a structure differing from that illustrated, and may for instance comprise a lever member 20 which can be disposed in a first unstable position (not shown) in order to actuate an automatic operating method of the transmission 1 and in a second stable position (not shown).
- [0027] In this case, the lever member 20 may also be manually displaced from the second stable position to two opposite unstable positions in order to command a unit increment (UP-SHIFT) of the gear engaged and a unit decrement (DOWN-SHIFT) of the gear engaged.
- [0028] The selector device 17 may also have a structure formed by steering-wheel commands (levers or push-buttons) in order to command a unit increment (UP-SHIFT) of the gear engaged and a unit decrement (DOWN-SHIFT) of the gear engaged. In this case, the selector device is provided with a push-button which can be actuated to select the automatic operating method.
- [0029] The electronic unit 15 comprises a first control system 22 of automatic type which receives as input the data signals and the control signals and processes them in a known manner in order to generate drive signals OPEN/CLOSE, SEL, ENG/DIS and to set an optimum transmission ratio. As is known, during the operating method of automatic type, the control system 22 detects the most appropriate external conditions (vehicle speed, rpm, accelerator pedal position, engine torque, etc.) for commanding a unit increment or decrement of the gear engaged. The control of the gear change is thus fully delegated to the control system 22 of the transmission. The use of commands dedicated to gear change requests is limited solely to requests for reverse gear and neutral.
- [0030] The electronic unit 15 further comprises a second control system 24 of manual type which receives as input the data signals and processes them in a known manner in order to generate drive signals OPEN/CLOSE, SEL, ENG/DIS and to set a

had requested is in any case performed.

[0044] When the block 150 has detected discordant requests, there is a transition to the block 130 which performs the command set manually, i.e. it generates drive signals adapted to bring about a unit gear increment (UP-SHIFT) or a unit gear decrement (DOWN-SHIFT) as a function of the manual actuation of the lever member 20 by the operator.

[0045] In operation, the method of the present invention manages the first automatic control system 22 and the second manual control system 24 by establishing the priorities between the gear commands set by the operator and those desired by the automatic control system 22; the following cases are in particular managed:

[0046] – gear change request from the operator followed by a gear change request from the automatic system 22 the gear change request from the operator is performed and for an immediately successive interval no account is taken of the gear changes requested by the automatic control system 22. The gear change request from the driver is maintained for at least a time-out (de-activation interval T_{sleep}) defined by the control system of the transmission. At the end of the time-out, the system returns to automatic management. This prevents a gear change request from the automatic management from following too closely on the request from the operator;

[0047] – gear change requested automatically followed by a gear change request from the driver: in this case there are two separate situations:

[0048] – concordant gear changes: the gear change requested by the operator is ignored as it would duplicate the gear change that the control system 22 is already requesting automatically. It is assumed in this case that the operator has not had time to become aware that the system is in the process of performing a gear change;

[0049] – discordant gear changes: account is taken of the operator's request.

[0050] This consequently provides a new method of operation in which, with the automatic method engaged, a gear change request from the driver is implemented and is interpreted as an instantaneous gear change suggestion without de-activating the automatic method and without the need for transition to the manual method.

